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BREEDING-SEASON FOOD HABITS OF BURROWING OWLS (*ATHENE CUNICULARIA*) IN SOUTHWESTERN DOMINICAN REPUBLIC

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ABSTRACT.—Diet data from 20 Burrowing Owl (*Athene cunicularia*) nests were collected in southwestern Dominican Republic in 1976, 1982, and 1996. Invertebrates (53.3%) comprised the most numerous prey items (N = 396) delivered to nests by adult owls, but vertebrates (46.7%) were much better represented than in other studies of Burrowing Owl diet. Among vertebrates, birds (28.3% of all items) and reptiles (14.9%) were most important, whereas mammals (1.0%) and amphibians (2.5%) were less commonly delivered to nests. Vertebrates, however, comprised more than twice (69.2%) of the total biomass as invertebrates (30.8%), with birds (50.4%) and reptiles (12.8%) the most important of the vertebrate prey classes. A positive relationship was observed between bird species abundance and number of individuals taken as prey by Burrowing Owls.

KEY WORDS: Athene cunicularia; *Burrowing Owl; diet; Dominican Republic; ecology.*

Habitos alimenticios durante la epoca reproductiva de *Athene cunicularia* en el suroeste de la República Dominicana

RESUMEN.—Datos de la dieta de 20 nidos de *Athene cunicularia* fueron colectados en el suroeste de la República Dominicana durante 1976, 1982 y 1996. Los invertebrados (53.3%), fueron los items más numerosos (N = 396) entregados en los nidos por los buhos adultos, pero los vertebrados (46.7%) fueron mucho mejor representados que en otros estudios sobre hábitos alimenticios de *Athene cunicularia*. Entre los vertebrados, las aves (28.3% de todos los items) y los reptiles (14.9 %) fueron los más importantes mientras que los mamíferos (1.0%) y los anfibios (2.5%) fueron menos comunes. Los vertebrados sin embargo, constituyeron más del doble (69.2%) del total de la biomasa. Los invertebrados (30.8%), aves (50.4%) y los reptiles (12.8%) fueron las clases más importantes de presas. Existió una relación positiva entre la abundancia de especies de aves y el número de individuos capturados como presas por *Athene cunicularia*.

[Traducción de César Márquez]

Burrowing Owls (*Athene cunicularia*) occur from western Canada south through the western U.S., Mexico, Central and South America, and irregularly in Florida and the West Indies. In the Caribbean islands they presently inhabit most of the Bahamas; Cuba, including several cays of the Sabana-Camagüey Archipiélago and the Isla de la Juventud (previously Isla de Pinos); and the western half of Hispaniola, including Gonâve and Beata islands (AOU 1998). The species formerly occurred throughout the Greater Antilles and several of the Lesser Antilles. Populations disappeared from Jamaica (Olson and Steadman 1977, Morgan 1993), the Cayman Islands (Morgan 1977, 1994), and Puerto Rico (Pregill and Olson 1981), possibly as a result of changing climate and habitat conditions, and predation by introduced mammals (Pregill 1981, Pregill and Olson 1981, Wiley 1986a). In the Lesser Antilles, Burrowing Owls recently occurred in St. Kitts, Nevis, Antigua, Redonda, and Marie Galante (AOU 1983). However, the two races endemic to the Lesser Antilles are thought to be extinct: *A. c. guadeloupensis* from Marie Galante, and *A. c. amaura* from Antigua, Nevis, Redonda, and St. Kitts, again partly as a result of predation by exotic animals (Greenway 1967).

In spite of the losses of several populations from former ranges and current concern for the species' survival in the Caribbean, little has been reported on the biology of Burrowing Owls in the region

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Table 1. Prey brought to nests by breeding Burrowing Owls, foothills of the Sierra de Bahoruco, southwestern Dominican Republic, 1976, 1982, and 1996.

	Number of Prey Items (%)				Biomass (%)	
Prey Species	Observed Brought to Nest (1976)	Prey Remains	Pellets	Total	Mean Prey Biomass (g)	Total
Mammals						
House mouse *Mus musculus*	1(2.8)	1(0.8)	1(0.4)	3(0.8)	21.0	63.0(2.1)
Black rat *Rattus rattus* (young)			1(0.4)	1(0.3)	80.0	80.0(2.6)
Total mammals	1(2.8)	1(0.8)	2(0.9)	4(1.0)		143.0(4.7)
Birds						
Common Ground-Dove *Columbina passerina*		2(1.6)	2(0.9)	4(1.0)	28.9	115.6(3.8)
Antillean Mango *Anthracothorax dominicus*	3(8.3)	5(3.9)	7(3.0)	15(3.8)	5.2	78.0(2.6)
Hispaniolan Emerald *Chlorostilbon swainsonii*		1(0.8)		1(0.3)	4.6	4.6(0.2)
Broad-billed Tody *Todus subulatus*	2(5.6)	6(4.7)	10(4.3)	18(4.6)	8.3	149.4(4.9)
Unidentified tody *Todus* sp.		2(1.6)	3(1.3)	5(1.3)	8.0	40.0(1.3)
Stolid Flycatcher *Myiarchus stolidus*	1(2.8)		1(0.4)	2(0.5)	24.1	48.2(1.6)
Hispaniolan Pewee *Contopus hispaniolensis*		2(1.6)		2(0.5)	11.5	23.0(0.8)
Northern Mockingbird *Mimus polyglottos*						
Adult			1(0.4)	1(0.3)	42.3	42.3(1.4)
Fledgling	1(2.8)	1(0.8)		2(0.5)	35.0	70.0(2.3)
Red-legged Thrush *Turdus plumbeus*		1(0.8)	1(0.4)	2(0.5)	74.0	148.0(4.9)
Black-whiskered Vireo *Vireo altiloquus*		3(2.3)		3(0.8)	19.1	57.3(1.9)
Flat-billed Vireo *Vireo nanus*			1(0.4)	1(0.3)	10.7	10.7(0.4)
American Redstart *Setophaga americana*	1(2.8)		1(0.4)	2(0.5)	8.7	17.4(0.6)
Green-tailed Warbler *Microligea palustris*	1(2.8)	5(3.9)	9(3.9)	15(3.8)	12.5	187.5(6.2)
Ovenbird *Seiurus aurocapillus*			1(0.4)	1(0.3)	18.7	18.7(0.6)
Bananaquit *Coereba flaveola*	1(2.8)	4(3.1)	12(5.2)	17(4.3)	8.7	147.9(4.9)
Black-crowned Palm-Tanager *Phaenicophilus palmarum*		1(0.8)	6(2.6)	7(1.8)	30.5	213.5(7.0)
Greater Antillean Bullfinch *Loxigilla violacea*		2(1.6)		2(0.5)	22.3	44.6(1.5)
Yellow-faced Grassquit *Tiaris olivacea*		1(0.8)	1(0.4)	2(0.5)	8.0	16.0(0.5)
Unidentified bird			10(4.3)	10(2.5)	9.6	96.0(3.2)
Total birds	10(27.8)	36(28.1)	66(28.4)	112(28.3)		1528.7(50.4)
Amphibians						
Eleutherodactylus abbotti	1(2.8)	3(2.3)	6(2.6)	10(2.5)	4.0	40.0(1.3)
Total amphibians	1(2.8)	3(2.3)	6(2.6)	10(2.5)		40.0(1.3)
Reptiles						
Ameiva chrysolaema	1(2.8)		5(2.2)	6(1.5)	8.9	53.4(1.8)
Anolis distichus	2(5.6)	4(3.1)	15(6.5)	21(5.3)	6.7	140.7(4.6)
Anolis semilineatus	3(8.3)	7(5.5)	9(3.9)	19(4.8)	6.4	121.6(4.0)
Sphaerodactylus cryphius	1(2.8)	4(3.1)	5(2.2)	10(2.5)	4.3	43.0(1.4)
Typhlops hectus		1(0.8)		1(0.3)	9.0	9.0(0.3)
Uromacer frenatus		1(0.8)	1(0.4)	2(0.5)	10.5	21.0(0.7)
Total reptiles	7(19.4)	17(13.3)	35(15.1)	59(14.9)		388.7(12.8)
Total vertebrates	19(52.7)	57(44.5)	109(47.0)	185(46.7)		2100.4(69.2)

Table 1. Continued.

PREY SPECIES	NUMBER OF PREY ITEMS (%)				BIOMASS (%)	
	OBSERVED BROUGHT TO NEST (1976)	PREY REMAINS	PELLETS	TOTAL	MEAN PREY BIOMASS (G)	TOTAL
Invertebrates						
unidentified locusts	5(13.9)	21(16.4)	38(16.4)	64(16.2)	2.0	128.0(4.2)
unidentified beetles	8(22.2)	28(21.9)	57(24.6)	93(23.5)	3.1	288.3(9.5)
unidentified tarantulas	3(8.3)	17(13.3)	19(8.2)	39(9.9)	9.7	378.3(12.5)
unidentified centipedes	1(2.8)	5(3.9)	9(3.9)	15(3.8)	9.3	139.5(4.6)
Total invertebrates	17(47.2)	71(55.5)	123(53.0)	211(53.3)		934.1(30.8)
Totals	36	128	232	396		3034.5(100.0)

(Wiley 1986a, 1986b). Here, I report on the high incidence of avian prey I observed in the diet of Burrowing Owls in southwestern Dominican Republic based on direct observations, prey remains, and regurgitated pellets collected at nests.

METHODS

Data were collected in southwestern Dominican Republic from March–June 1976, June–July 1982, and March 1996 from occupied Burrowing Owl nests along the lower slopes of the Sierra de Bahoruco, from Cruce de Limón near Lago Enriquillo (elevation 30 m) south to El Naranjo west of Puerto Escondido (elevation 350 m). The area is in the subtropical dry woodland zone (Union Panamericana 1967) characterized by acacia-cactus woodland that becomes more luxuriant with increasing elevation (Durland 1922). Typical vegetation include cacti (guasábara pilotera *Opuntia antillana,* cagüey *Neoabbottia paniculata,* cayuco *Pilosocereus polygonus*), palmera yarey (*Copernicia berteroana*), bayahonda (*Prosopis juliflora*), *Capparis* spp., baitoa (*Phyllostylon brasiliensis*), aroma (*Acacia farnesiana*), guayacán (*Guajacum officinale*), guayacancillo (*Guajacum sanctum*), almácigo (*Bursera simaruba*), guano (*Coccothrinax argentata*), and doncella (*Byrsonima lucida*). Annual rainfall averages about 455 mm, with peaks in January, April–May, and August–November.

Owls were common in the area and nested wherever suitable substrate was available. I systematically surveyed the owl population in my study area by foot on several occasions, paying special attention to the presence of nest sites. All possible nests were revisited a minimum of four times to confirm their occupancy. In 1976, one 9-ha study plot contained 18 occupied owl nests ($\bar{x}$ = 1 nesting pair per 0.5 ha), concentrated in three colonies of 3, 8, and 7 pairs (mean nearest-neighbor distance = 22.5 ± 6.7 m SD; range = 15–35 m).

All old pellets (i.e., regurgitated castings) and prey remains were cleared from study nests the day before I began each period of data collection. I spent 42 hr observing two occupied nests from blinds placed 4 m from the burrows on 14–15 April (1600–2300 H), 15–16 April (1930–0600 H), 30 April–1 May (2200–0530 H), 1–2 May (1600–2300 H), and 15–16 May (1630–0230 H), 1976. Although observations are preferable to prey remains and pellets for analyzing diets of birds of prey (Snyder and Wiley 1976), prey remains and regurgitated pellets do provide traditional materials for examination of raptor food habits (Errington 1930). I collected remains and pellets at eight nests in 1976, five in 1982, and five in 1996. Observations from blinds were made at different nests than those from which I collected pellets and prey remains. All data were collected during the nestling stage before young emerged from nests. Prey remains and items in pellets were identified by comparison with specimens in the Museo Nacional de Historia Natural (Santo Domingo; MNHN), using a dissecting microscope when needed. Prey biomass was determined from animals captured in or near my study area, from specimen data labels in the MNHN, and from data provided by Anabelle Dod. I surveyed bird populations for relative abundance of species using fixed transects (Emlen 1971, 1977) and mist nets on or adjacent to the Burrowing Owl study area.

RESULTS

A total of 396 prey items was identified at least to order (Table 1). Invertebrates (53.3% of all prey items) made up the most numerous items brought to nests by adult owls. Beetles (23.5% of all items), locusts (16.2%), and tarantulas (9.9%) were the most commonly delivered prey. Birds (28.3%) and reptiles (14.9%) were also important items, whereas mammals (1.0%) and amphibians (2.5%) made up only a minor portion of the prey brought to nests. Among birds, Broad-billed Todies (*Todus subulatus*; 4.6% of items), Bananaquits (*Coereba flaveola*; 4.3%), Antillean Mangos (*Anthracothorax dominicus*; 3.8%), and Green-tailed Warblers (*Microligea palustris*; 3.8%) were the most common items. Among reptiles, anole lizards (*Anolis distichus,* 5.3%

and *A. semilineatus,* 4.8%) were the most frequently delivered species.

At the two nests watched from blinds in 1976, the prey delivery rate averaged 0.86 ± 0.68 (±1 SD) items per hour. A young rat (*Rattus rattus*) observed brought to a nest by an adult was estimated to weigh about 80 g and represented the largest prey item (53% of mean adult Burrowing Owl biomass) in the sample. The largest avian prey items delivered were Red-legged Thrushes (*Turdus plumbeus;* $\bar{x} = 74 \pm 2.53$ g, $N = 17$; 49% of mean adult owl mass).

Whereas invertebrates were the most numerous items brought to nests by adult owls, vertebrates comprised more than twice (69.2%) as much of the total biomass as invertebrates (30.8%) in the combined samples, with birds (50.4%) and reptiles (12.8%) the most important of the vertebrate prey classes. Mean weights of prey species ranged from 2.0–80.0 g, with vertebrates averaging 18.7 ± 19.0 g and invertebrates 6.0 ± 4.0 g. The greatest range within prey categories occurred among birds, which varied from 4.6–74.0 g.

I found a positive relationship between bird species abundance and numbers of individuals taken as prey by Burrowing Owls (Spearman Rank Correlation, $Z = 2.1$, $P = 0.04$, $N = 17$). I did not evaluate relative abundance of populations of other prey categories but, based on my casual observations, at least reptiles showed some degree of correlation between abundance and numbers taken as Burrowing Owl prey.

DISCUSSION

Burrowing Owls in North America feed primarily on invertebrates (90.9%) and only occasionally eat mammals (6.9%), reptiles and amphibians (2.0%), and birds (0.3%) (summarized in Earhart and Johnson 1970 and Snyder and Wiley 1976). The diet of Burrowing Owls in the West Indies has been reported as consisting of small rodents, small reptiles, frogs, and, especially, large insects, including crickets, grasshoppers, and beetles (e.g., Brudenell-Bruce 1975, Campbell 1978, Dod 1978, Garrido 1992, Kirkconnell et al. 1992). Danforth (1929) reported the contents of two Burrowing Owl stomachs, one of which contained mouse fur, whereas the other contained beetle and centipede parts. Abbott (*in* Wetmore and Swales 1931) found one Burrowing Owl stomach contained one lizard, one scorpion, one mouse, and several insects.

Although avian prey were particularly well-represented in my samples, only occasional mention has been made of Burrowing Owls preying on birds in the West Indies (Brudenell-Bruce 1975, Dod 1978, Kirkconnell et al. 1992), including two cases of cannibalism or scavenging (Abbott *in* Wetmore and Swales 1931, Brudenell-Bruce 1975). Gnatcatchers (*Polioptila* sp.) were among the contents of five Burrowing Owl stomachs collected by Regalado (1975) in Cuba. "R.H.L." (1883) reported the remains of Black-cowled Orioles (*Icterus dominicensis*), Greater Antillean Grackles (*Quiscalus niger*), and Common Ground-Doves (*Columbina passerina*) at Burrowing Owl nests in Haiti. In the southern Bahama Islands, Buden (1974) noted a high proportion of avian prey in Barn Owl (*Tyto alba*) food remains compared with continental samples. He suggested that these results reflected lower abundance of rodents on islands.

Generally, direct observations of prey delivered by raptors to their nests reveal a higher proportion of smaller and more delicate items, such as some arthropods, than do examinations of prey remains and regurgitated pellets (Snyder and Wiley 1976). Thus, small items generally are underrepresented in analyses of remains and pellets. However, the proportion of invertebrates (47.2%) I observed brought to the nests was slightly lower than that represented by remains (55.5%) and pellet contents (53.0%). Collectively, vertebrates (52.8%) were observed brought to the nests as often as invertebrates. The combined data from prey remains and pellet contents revealed higher incidence of invertebrates (53.9%), but vertebrates (46.1%) were not far outnumbered by arthropods. Based on prey biomass, however, vertebrates clearly represented a far more important food source than did invertebrates during the breeding season.

All of the prey species brought to nests by Burrowing Owls were common and, among birds, all but the American Redstart (*Setophaga americana*) and Ovenbird (*Seiurus aurocapillus*) are residents in Hispaniola.

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